Documents pour l'histoire des techniques
Nouvelle série

19 | 2e semestre 2010
Les techniques et la technologie entre la France et la Grande-Bretagne XVIIe-XIXe siècles

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Joost Mertens

Édition électronique
URL : http://journals.openedition.org/dht/1541
ISSN : 1775-4194

Éditeur :
Centre d'histoire des techniques et de l'environnement du Cnam (CDHTE-Cnam), Société des élèves du CDHTE-Cnam

Édition imprimée
Date de publication : 1 décembre 2010
Pagination : 277-285
ISBN : 978-2-9530779-5-7
ISSN : 0417-8726

Référence électronique
Joost Mertens, « The mere handicrafts : Ure's Dictionary (1839-1853) compared with the Dictionnaire technologique (1822-1835) », *Documents pour l'histoire des techniques* [En ligne], 19 | 2e semestre 2010, mis en ligne le 21 juin 2011, consulté le 19 avril 2019. URL : http://journals.openedition.org/dht/1541

The mere handicrafts: Ure's *Dictionary* (1839-1853) compared with the *Dictionnaire technologique* (1822-1835)

Joost Mertens

"As in the former editions, the mere handicrafts were not included, as it was not possible without greatly extending the work to comprehend them"
Robert Hunt, "Preface to the fifth edition (August 1860)" *Ure's Dictionary*, 6th edition, London, Longmans, Green & Co., 1867, Vol. 1, p. ix.

In 1777, Johann Beckmann published his *Anleitung zur Technologie*.[1] It stood at the beginning of the tradition of special technology, that is the description of arts and manufactures or, in Sebestik's more precise formulation, the description of particular arts as combinations of different operations ordered in a sequence.[2] Beckmann had many followers, in Germany but also in France and England. They produced a wide variety of textbooks, manuals, dictionaries, encyclopedias, and historical surveys, and in this way established the discipline of technology or "science of the industrial arts" according to Louis-Sébastien Lenormand's short definition.[3]

In this paper, two technological productions, a French and a British technological dictionary, will be compared:

Louis-Sébastien Lenormand & Louis-Benjamin Francœur, *Dictionnaire technologique, ou nouveau dictionnaire universel des arts et métiers, et de l'économie industrielle et commerciale*, Paris, Thomine & Fortic, 1822-1835.

Andrew Ure, *Dictionary of arts, manufactures, and mines, containing a clear exposition of their principles and practice*, London, Longman, Orme, Brown, Green, & Longmans, 1839, 1840[2], 1843[3], 1853[4].

The French dictionary, comprising 22 volumes, was published between 1822 and 1835. The first edition of Ure's *Dictionary* was published in 1839. The French version has four million words. The British version has one million words. The simple question why this difference of three million words has a simple answer. Ure has omitted several branches of human industry. The arguments for this omission, however, will lead to broader issues such as the significance of the manufacturing industry, the status of handicrafts and artisans, engineering, machines, and the technological utopia of the automatic factory.

Short history of technology in France (1793-1822)

The German tradition of the technological description of arts and manufactures entered France in 1793, when Jean-Henri Hassenfratz opened a public course of technology at the newly established *Lycée des Arts*. Then, in 1800, Robert Bray O'Reilly launched a technological journal called *Annales des arts et manufactures*, that would cover recent discoveries relating to the arts, manufactures, agriculture, and commerce. This journal featured a special section called *Technologie*, and Lenormand contributed

1 Johann Beckmann, *Anleitung zur Technologie, oder zur Kentniß der Handwerke, Fabriken und Manufacturen, vornehmlich derer, welche mit der Landwirthschaft, Polizey und Cameralwissenschaft in nächster Verbindung stehn,* Göttingen, Wittwe Vandenhoeck, 1777.
2 Jan Sebestik, "The rise of the technological science", *History and Technology,* 1, 1983, pp. 25-44.
3 Louis-Sébastien Lenormand, "Considérations sur les avantages que présente la Technologie, et sur les moyens propres à faciliter l'étude de cette science", *Revue encyclopédique,* 1, 1819, pp. 227-244. For the general history of the technological movement, see Albrecht Timm, *Kleine Geschichte der Technologie,* Stuttgart, Kohlhammer, 1964, and Jacques Guillerme & Jan Sebestik, "Les commencements de la technologie", Thalès, 12, 1966, pp. 1-72, republished in *Documents pour l'histoire des techniques*, 14, 2007, pp. 49-122.

many articles to this section. In 1802, Beckmann's *Anleitung zur Technologie*, fifth edition, was reviewed in the very first issue of the *Bulletin de la Société d'encouragement pour l'industrie nationale*, and the Society proposed to have Beckmann's work translated into French. In 1804, the *Almanach Sous-Verre*, a periodical for the announcement and advertisement of all kinds of inventions, began to feature a section called *Technologie*, and it had close connections with O'Reilly's *Annales des arts et manufactures*. In 1818, Joseph-Antoine Borgnis published his three-volume *Traité complet de mécanique appliquée aux arts*, in which he reminds his readers that applied mechanics is just one part of a vast science called technology that embraces the entire domain of human industry. In 1819, Gérard-Joseph Christian, director of the *Conservatoire des arts et métiers*, published his *Plan de technonomie*, a treatise on general technology. Jacques Guillerme and Jan Sebestik rediscovered this theorist of technology in the 1960s. They consider Christian's technonomy as a kind of missing link between Beckmann's general technology (1806) and the theories of manufactures published by Charles Babbage and Andrew Ure in the 1830s. In 1820, Louis-Sébastien Lenormand and Jean-Gabriel-Victor de Moléon launched the *Annales de l'industrie*, subtitled *Mercure technologique*. This technological journal tried to fill the gap created by the discontinuation, in 1818, of the *Annales des arts et manufactures*. Finally, in 1822, Lenormand and Francœur published the first two volumes of their *Dictionnaire technologique.*[4]

Genealogy of Ure's *Dictionary*

Ure's *Dictionary* is a member of a series of dictionaries that reaches from Macquer's *Dictionnaire de chymie* (1766) to Karmarsch's *Technisches Wörterbuch* (1843) and Laboulaye's *Dictionnaire des arts et manufactures* (1847). This series is in itself a splendid example of the frequent technological exchanges between France and England.

It all started in 1766, when Pierre-Joseph Macquer published his famous *Dictionnaire de chymie*. The English translation of this dictionary, by James Keir (1771), inspired William Nicholson to produce his own *Dictionary of chemistry* in 1795. In 1808, Nicholson revised and extended his dictionary, adding a lot of chemical technology or practical chemistry. This *Dictionary of practical and theoretical chemistry* followed the pattern of Jean-Antoine Chaptal's *Chimie appliquée aux arts* (1807), which Nicholson had translated into English. Nicholson's chemical dictionary was the model for Andrew Ure's *Dictionary of chemistry on the basis of Mr. Nicholson's* (1821).[5] This work was translated into French by Jean Riffaut (*Dictionnaire de chimie*, 1824).

In 1839, Ure transformed his chemical dictionary into a general dictionary of the industrial arts by including many entries on the mechanical arts. Ure had spent the autumn of 1834 in wandering through the factory districts of Lancashire, Cheshire, and Derbyshire, and the results of this study had appeared in his *Philosophy of manufactures* (1835).[6] This knowledge of the British manufacturing industry was converted into a large number of articles for the *Dictionary of arts, manufactures and mines*.

By 1853, the fourth edition of this dictionary comprised two volumes of about one thousand pages each, almost twice as large as the original dictionary of 1839. In the 1840s, Ure's dictionary became the model for two similar works, in Germany and France.[7]

Lenormand's classification of human industry

For the actual comparison of the two technological dictionaries, two basic features of the French *Dictionnaire technologique* have to be discussed briefly.

First, Lenormand, the main editor, looked upon his

4 Emmanuel Grison, "L'éducation pour les arts et métiers : J.-H. Hassenfratz (1755-1827), publiciste et professeur", *Annales historique de la Révolution française,* 67, 1995, pp. 555-569 ; Hélène Vérin, "La technologie : science autonome ou science intermédiaire", *Documents pour l'histoire des techniques*, 14, 2007, pp. 134-143 ; Liliane Pérez, Marie Thébaud-Sorger, "Les techniques dans la presse d'annonces au XVIII[e] siècle en France et en Angleterre : réseaux d'information et logiques participatives", in Patrice Bret, Konstantinos Chatzis, Liliane Pérez ed., *La presse et les périodiques techniques en Europe 1750-1950,* Paris, L'Harmattan, 2008, pp. 11-50 ; Joost Mertens, "Technology as the science of the industrial arts: Louis-Sébastien Lenormand (1757-1837) and the popularization of technology", *History and Technology,* 18, 2002, pp. 203-231; id., "The Annales de l'industrie (1820-1827) : a technological laboratory for the industrial modernization of France", *History and Technology*., 20, 2004, pp. 135-163.

5 William H. Brock, *The Fontana history of chemistry,* London, Fontana, 1992, p. 273.

6 This general technology was translated into French, *sous les yeux de l'auteur*, in 1836: Andrew Ure, *Philosophie des manufactures, ou économie industrielle de la fabrication du coton, de la laine, du lin et de la soie, avec la description des diverses machines employées dans les ateliers anglais,* Paris, Mathias, 1836.

7 Karl Karmarsch & Friedrich Heeren, *Technisches Wörterbuch, oder Handbuch der Gewerbskunde, in alphabetischer Ordnung, bearbeitet nach Dr. Andrew Ure's "*Dictionary of Arts, Manufactures, and Mines*",* Prague, Haase, 1844; Charles Laboulaye, *Dictionnaire des arts et manufactures: Description des procédés de l'industrie française et étrangère,* Brussels, Decq, 1847.

creation as a "complete course of technology" or, more poetically, as "the universal catechism of the arts".[8] It should offer a precise description of every art under the sun, and it would embrace the entire domain of human industry, including the arts and crafts, manufactures, commerce, and agriculture. It should include all technologies actually in use: traditional ones, the perfections brought about during the preceding decades, and radically novel manufacturing processes. In short, it should provide descriptions of "everything done by hand or by means of machines".[9]

Second, the *Dictionnaire technologique* employs a certain classification. Industry, so Lenormand, consists in the use of both human energy (labour) and the energy from different sources, such as draught animals, beasts of burden, gravity, the wind, expansive fluids, heat, and chemical affinity, for the transformation of raw materials into useful products.[10] These powers can be seen at work in transport, treadmills, sailing, windmills, waterwheels, steam engines, and the chemical arts. There are two types of industry: (a) agriculture, including cattle and horse breeding, which makes use of the powers of life; (b) the manufacturing industry, which makes use of non-biological mechanical, physical, and chemical powers. This leads to four classes of industrial arts: agriculture, the mechanical arts, the physical arts, and the chemical arts. But then Lenormand comes up with a fifth branch of technology. It is called "Technology in the strict sense" or *pure technology*, and it consists in the decription of "all other Arts that proceed manually or by means of more or less complex tools".[11]

In order to shed more light on this category of pure technology, let us turn to Christian's general analysis of human industry in the first part of his theoretical technology of industrial operations.[12] Human industry includes three stages:

- agriculture, or the procurement of raw materials;
- industrial labour, or the mechanical and chemical treatment of these materials;
- commerce, or the distribution of the products of this treatment.

Industrial labour consists in either the transformation of raw materials or the preparation of new chemical compounds from these materials. In the first case, we speak of mechanical arts, in the second case of chemical arts. Industrial labour, whether mechanical or chemical, is performed in two modes, the mode of the craftsman (*mode métier*) and the mode of the manufacturer (*mode manufacture*). The first mode is characterized by manual skills, more or less complex tools, and regular attention, while in manufactures or factories labour is divided and partly supplanted by machines. The second mode is thus characterized by division of labour, mechanization, and applied science.

The articles included in the *Dictionnaire technologique* under the head of *Technologie* (i.e. Lenormand's category of pure technology) are descriptions of the arts and crafts practised in the mode of the craftsman.

Ure's omissions

Completely arbitrarily, I collected all the terms *jkl* between *jable* and *lyre* in the *Dictionnaire technologique*. There are 168 of them. I translated these terms into English, and then I checked whether these terms figure in Ure's *Dictionary*. Figure 1 shows a selection of 48 terms. What did I find?

- Only about 20% of the articles in the French dictionary can also be found in Ure's *Dictionary*.
- Practically the entire category of *Technologie* is absent from Ure's *Dictionary*.
- There are no articles on agriculture in Ure's *Dictionary*.

But agriculture and the handicrafts are not the only omissions. Ure did not include any entries on the subjects of transport, distribution, or commerce, whereas the *Dictionnaire technologique* pays ample attention to such economic and financial institutions as *assurance, banqueroute, capital, comptabilité, facture, faillite, impôt, intérêt, lettre de change, lettre de crédit, marché, monopole*, etc. Neither did Ure refer to institutions for technical education or technological progress. In the *Dictionnaire technologique*, there are entries on various forms of patents (*brevet, patente, privilège*), the traditional structures of trades and crafts (*communautés, corporation, jurandes, maîtrise*), and two important institutions for technical education (*Conservatoire des arts et métiers, Ecoles d'arts et métiers*). But Ure did not think of presenting any information on such British institutions as Anderson's Institution (where Ure had taught chemistry and physics for twenty-five years), the Mechanics' Institutes, the Society for the Diffusion of Useful Knowledge, the Royal Institution, the Penny Cyclopædia, etc. Perhaps the strangest omission, however, is the practice of engineering, both civil and mechanical. In Ure's *Dictionary*,

8 This is how Barbier-Vémars, the editor of the *Annales des arts et manufactures* after O'Reilly's death in 1807, had christened such a project of the complete description of the useful arts.

9 Louis-Sébastien Lenormand, "Technologie", *Encyclopédie moderne,* Vol. 22, 1832, pp. 63-67.

10 Id., "Discours préliminaire", *Dictionnaire technologique, Vol.* 1, 1822, pp. vii-xliii.

11 *Ibid*., p. xxxix.

12 Gérard-Joseph Christian, *Vues sur le système général des opérations industrielles, ou Plan de technonomie,* Paris, Mme Huzard & Mme Courcier, 1819, pp. 39-44.

Ure's *Dictionary* (1839-1853) compared with the *Dictionnaire technologique* (1822-1835)

Dictionnaire technologique	Category	English translation	Ure's *Dictionary*
jable	technologie	groove; chime	
jumelles		cheeks	
jurandes		wardenship	
justifier	technologie	justify	
kali	technologie	kali	y
kaolin	arts chimiques	kaolin	y
karabé		amber	y
karat	technologie	carat	y
kermès		kermes	y
kilo	technologie	kilo(gram)	
kino		kino	y
kirschwasser	technologie	kirschwasser	y
labeur	technologie	cultivation	
laboratoire		laboratory	
labourage	agriculture	tillage	
labyrinthe	technologie	labyrinth	
lacet		lace	
lacet	technologie	springe, noose	
laceur	technologie	net-maker	y
lacs	technologie	cord, string	
lactates		lactates	
lainage		woollens	
lainer		teasel	y
laines		woollen manufacture	y
lait	arts chimiques	milk	y
laiterie	économie rurale	dairy	
laiton	arts chimiques	brass	y
lambourde	architecture	joist	
lambris	architecture	panelling	
laminage	arts mécaniques	flattening	
laminoir	arts mécaniques	rolling-mill	y
lampes	arts physiques	lamps	y
lampiste	technologie	lamp-maker	
lance	technologie	lance	
lancette	technologie	lancet	
landau		landau	
landes	agriculture	moor	
langue de carpe	technologie	carp's tongue	
lanterne	technologie	lantern	
lanterne magique	arts physiques	magic lantern	
lapidaire	technologie	lapidary	y
lapin		rabbit	
laque		lac	y
lardoire	technologie	larding-pin	
lardon	technologie	filling piece	
larmes bataviques	arts chimiques	glass drops	
lyre	arts physiques	lyre	

fig. 1 - Ure's Dictionary compared with the *Dictionnaire technologique*

there are no entries on the cons-truction of roads, bridges, canals, machines, engines, factories, furnaces, or other structures that play such an important role in industrial production. The *Dictionnaire technologique*, on the other hand, contains extensive articles on *pompes, machines, machine à vapeur, roues hydrauliques, chemin, ponts, canal de navigation, grue*, etc.

All these omissions – agriculture, commerce, the handicrafts, engineering, and technological institutions – go a long way to explain the difference of three million words between the *Dictionnaire technologique* and the *Dictionary of arts, manufactures, and mines*.

However, Ure did not omit all these industrial activities accidentally. On the contrary, he presented an explicit argument for his omissions. This argument can be found in his classification of what he calls operative industry:

> It is the business of operative industry to produce, transform, and distribute all such material objects as are suited to satisfy the wants of mankind. The primary production of these objects is assigned to the husbandman, the fisherman, and the miner; their transformation to the manufacturer and artisan; and their distribution to the engineer, shipwright, and sailor. The unworked or raw materials are derived, 1. from the organic processes of vegetables and animals,

> conducted either without or with the fostering care of man; 2. from the boundless stores of mineral and metallic wealth, arranged upon or within the surface of the earth by the benignant Parent of our being […] The task which I have undertaken in the present work, is to describe and explain the transformations of these primary materials, by mechanical and chemical agencies, into general objects of exchangeable value; leaving, on the one hand, to the mechanical engineer, that of investigating the motive powers of transformation and transport; and, on the other hand, to the handicraftsman, that of tracing their modifications into objects of special or local demand[13].

Echoing Christian, Ure divides the general processes of operative industry into three stages: (1) the procurement of raw materials (primary production: husbandry, fishing, mining), (2) the mechanical and/or chemical transformation of these materials (arts and manufactures), (3) the stage of mercantile production and distribution (transport and commerce). In drawing up his dictionary, he omitted many links of this chain of production, retaining only certain aspects of mining, and industrial transformation "in the mode of the manufacturer", preferably in its mechanized or automated form. Whale, herring, cod, salmon, cows, goats, sheep, pigs, and even horses cannot be found in Ure's *Dictionary*. For agriculture, he simply refers to three encylopedias by John Claudius Loudon, of gardening (1824), agriculture (1827), and plants (1829). For the third stage, the domain of the engineer, shipwright, and sailor, the reader is referred to John Ramsay McCulloch's *Dictionary, practical, theoretical and historical, of commerce and commercial navigation* (1832). From the second stage – industrial production *stricto sensu* – the handicrafts which bring about industrial transformation "in the mode of the craftsman" are omitted, because they do not lead to "general objects of exchangeable value". So, it is Ure's intention to describe the transformation, in the mode of the manufacturer, of raw materials into general objects of exchangeable value. He is not interested in the industrial activities of artisans or craftsmen.

An example, the transformation of iron ore into bar iron, plate iron, steel, and tinplate.[14] The first stage of this process, the primary production of iron ore, consists of the construction of a mine, the extraction of the ore, and the transportation of this material to the smelting station, where it enters the second stage of the process. In this first stage, engineers play a most important role. They are responsible for the construction of a mine, including pumps for drainage, ventilating apparatus, hoisting apparatus, steam engines, and waterwheels. They are also active in the construction of roads, bridges, canals, railways, harbours, docks, and cranes. None of these terms can be found in Ure's *Dictionary* as separate entries. No bridges, no canals, no machines, no steam engines. This is as it should be, according to Ure, since engineering does not belong to the manufacturing industry.

In the second stage, iron ore is transformed into cast iron in a blast furnace. This product is then further refined in finery furnaces, puddling furnaces and cementation furnaces into bar iron, plate iron, steel and tinplate by the action of hammers, cylinders, shears, tilt-hammers, rollers, etc. Again, none of these terms figure in Ure's *Dictionary* as separate entries. They can be found in entries such as Iron, Smelting and Metallurgy as apparatus employed by the iron-master. But their design and construction belong to engineering, not to the manufacturing industry.

The output of this second stage is put on the general market, where it is absorbed by the manufacturing industry for the production of such commodities as anchors, nails, needles, and wire, but also by a variety of handicrafts for the production of "objects of special or local demand". This latter activity takes place in the workshops of various artisans, and is of no concern to Ure: "When the iron is fashioned into ever varying and capricious forms, they belong either to the general business of the founder and cutler, or to the particular calling of some handicraft, as the locksmith, gratesmith, coachsmith, gunsmith, tinman, &c".[15] Most of these metalworkers neglected by Ure, do find a place in the *Dictionnaire technologique* under the head of pure technology: *fondeur, coutelier, serrurier, sellier-carrossier, arquebusier, ferblantier*.

Ure's utopian view of the automatic factory

Ure's neglect of both agriculture and the handicrafts is highly unrealistic. In his *Philosophy of manufactures*, he presents some results of the Parliamentary Returns of 1831:[16]

Agricultural labourers and labouring occupiers	31%
Manufacturing labourers	11%
Persons employed in retail trade, or in handicraft	34%
Capitalists, bankers, etc.	6%
Other labourers	18%
Total	100%

13 Andrew Ure, "Preface", *Dictionary of arts, manufactures, and mines,* 1839, pp. iii-vii.

14 *Ibid*., pp. iii-iv.

15 *Ibid*., p. iv.

16 Andre Ure, *The philosophy of manufactures: or, an exposition of the scientific, moral, and commercial economy of the factory system of Great Britain,* London, Charles Knight, 1835, pp. 4 & 80.

These figures show that Ure's neglect of agriculture and the handicrafts leads to the exclusion of almost two-thirds of the British economy. Ure devotes his dictionary to only about ten per cent of the actual industrial activities found in Great Britain. This highly selective behaviour stems from what might be called Ure's utopia of the automatic factory. In 1835, in a world where artisans and tradesmen were still going strong, he was dreaming of a situation where manual labour would be completely superseded by automated production:

> Manufacture is a word, which, in the vicissitude of language, has come to signify the reverse of its intrinsic meaning, for it now denotes every extensive product of art, which is made by machinery, with little or no aid of the human hand; so that the most perfect manufacture is that which dispenses entirely with manual labour.[17]

Ure's perfect manufacture is no longer characterized by the division of manual skills into a series of partial manual skills, as was thought to be the "grand principle" in the time (the 1770s) "when Adam Smith wrote his immortal elements of economics",[18] but by the replacement of manual by mechanical operations. The perfect manu-facture is a Factory, that is "a system of productive machines continuously impelled by a central power".[19] And, Ure adds, "I conceive that this title [of factory], in its strictest sense, involves the idea of a vast automaton, composed of various mechanical and intellectual organs, acting in uninterrupted concert for the production of a common object, all of them subordinated to a self-regulated moving force".[20] In 1835, British industry was far from having realized the factory system of production. It was still largely a dream of the future. It was only in the textile industry, notably the cotton industry, that something approaching an automaton was actually to be seen.

However, Ure's utopia of the automatic factory was not just a dream. In the here and now it functioned as a selection criterion in drawing up his dictionary of arts. In general, Ure excludes the mere handicrafts from his dictionary, except when some self-acting machine has penetrated a certain traditional handicraft. Here are some examples.

In 1844, Ure published a supplement to his dictionary.[21] The new entries, from Arrow Root to Ventilation, have later been included in the fourth edition (1853) of his dictionary. One of the recent improvements deserving a place in his technological collection of arts and manufactures is the « well organised manufacture » of arrow root. The article describing this improvement clearly shows in what way Ure succeeds in neglecting manual labour. It is in fact the description of Hopewell Estate on the Caribbean island of Saint Vincent, where the roots of *maranta arundinacea* are transformed, by grinding and elutriation, into a species of starch commonly called arrow root. The growing, harvesting, skinning, and cleansing of the roots require much hard labour under the tropical sun, but since these (agricultural) operations belong to the first stage of primary production of skinned and cleansed roots, this part of the process is wholly disregarded by Ure. The extraction of arrow root starch, on the other hand, is done mechanically by rollers, cylinders, and paddles, driven by a waterwheel. And this is manufacture, « with little or no aid of the human hand ».[22]

The second example, Biscuits, is an ode to the automatic bakeries in Deptford, Gosport, and Plymouth, and to the replacement of manual skills by the factory system. Before 1829, the ships' biscuits for the Royal Navy had been produced at the Clarence Victualling Yard in Gosport, near Portsmouth, in the mode of the craftsman. This mode of making biscuits by hand requires much sweat and dexterity. In 1829, however, Thomas Tassel Grant, Storekeeper of Clarence Yard, invented a mechanical method of baking biscuits, and in 1853 his system of mixing, kneading, and cutting machines, driven by a steam engine, produced 2,240 pounds of biscuit per hour, employing 16 unskilled operatives, against the 1,500 pounds of ancient biscuit made by 45 skilled workmen.[23]

In 1795, the London Corresponding Society was, above all, a society of artisans.[24] Figure 2 shows a list of 36 trades the members of the LCS were engaged in. The figure also shows the French translation of the names of these trades, as well as the answer to the question whether these handicrafts figure in Ure's *Dictionary* (1853) or the *Dictionnaire technologique*.

The list confirms our earlier conclusion that Lenormand and Francœur intend to include every art under the sun, while Ure tends to exclude handicraft production. Yet, eight handicrafts, or former handicrafts, have found a place in the fourth edition of his dictionary. Did Ure deviate from his original intentions in these cases? Six

17 *Ibid*., p. 1.

18 *Ibid*., p. 19.

19 *Ibid*., p. 13.

20 *Ibid*., pp. 13-14.

21 Andrew Ure, *Recent improvements in arts, manufactures, and mines: being a supplement to his dictionary,* London, Longman, Brown, Green, & Longmans, 1844.

22 Andrew Ure, "Arrow root", *Dictionary of arts, manufactures, and mines,* 4th ed., 1853, vol. 1, pp. 80-82.

23 Andrew Ure, "Biscuits", *Dictionary of arts, manufactures, and mines, op. cit*., n. 22, pp. 168-170.

24 Edward P. Thompson, *The making of the English working class,* London, Penguin, 1988, p. 170.

		DAMM-1853	*Dict. techn.*
baker	boulanger		y
book-binder	relieur	y	y
bookseller	libraire		y
bricklayer	maçon		y
butcher	boucher		y
cabinet-maker	ébéniste		y
carpenter	charpentier		y
carver	sculpteur		y
china burner	porcelainier		y
cordwainer	cordonnier		y
dyer	teinturier	y	y
engraver	graveur		y
founder	fondeur	y	y
frame-work cutter	charpentier		y
glazier	vitrier	y	y
goldsmith	orfèvre		y
hairdresser	perruquier		y
hatter	chapelier	y	y
hosier	bonnetier	y	y
japanner	vernisseur (en laque)		y
labourer	ouvrier		y
locksmith	serrurier		y
machine-maker	machiniste, mécanicien	y	y
mercer	mercier		y
merchant	marchand		y
plumber	plombier		y
ribbon-dresser	rubannier		y
shoemaker	cordonnier		y
silversmith	orfèvre		y
tailor	tailleur		y
tinplate-worker	ferblantier		y
turner	tourneur		y
upholsterer	tapissier		y
warehouseman	marchand en gros		y
watchmaker	horloger		y
weaver	tisserand	y	y

fig. 2 - Trades of the members of the London Corresponding Society (1795)

examples may shed some light on this question.

Ure's description of the art of founding[25] shows that between 1795 and 1853 this art had become transformed into a manufacture, where iron is re-melted and moulded by means of divided labour, grinding mills, cranes, blowing machines, and steam engines.

The same is true for the art of weaving. The article devoted to this technology[26] is in two parts: weaving by hand, and weaving by power. In the first part, Ure describes the "European loom, as it has existed for several centuries". But in 1853, "the greater part of plain weaving, and much even of the figured, is now performed by the power loom, called *métier mécanique à tisser* in French". For a more detailed description of weaving in the mode of the manufacturer, Ure refers the reader to his study of the British cotton industry.[27]

Even in 1853, bookbinding was a handicraft from beginning to end. The main part of Ure's description[28] is devoted to this art "according to its present mode" (i.e. the mode of the craftsman), the more or less complex tools used by bookbinders, and various patented

25 Andrew Ure, "Founding", *Dictionary of arts, manufactures, and mines, op. cit.*, n. 22, pp. 804-814.

26 Andrew Ure, "Weaving", *Dictionary of arts, manufactures, and mines, op. cit.*, n. 22, vol. 2, pp. 930-935.

27 Andrew Ure, *The cotton manufacture of Great Britain systematically investigated, with an introductory view of its comparative state in foreign countries, drawn chiefly from personal survey,* London, Knight, 1836.

28 Andrew Ure, "Bookbinding", *Dictionary of arts, manufactures, and mines, op. cit.*, n. 22, pp. 228-232.

improvements introduced during the first four decades of the nineteenth century. But at the end of the article, Ure introduces the idea of mechanical bookbinding, made possible by an invention of Thomas Richards patented in 1842. Richards' system consists of a sewing machine, a sheet feeder, needle bars, pincers, and levers, "to form a collection or book of sheets, ready for boarding or finishing".

In the article Dyeing[29], Ure goes into the long history of this chemical practice, its theoretical background (colour optics, rules of colour mixing, laws of contrast), and the chemical theory of dyeing, from Dufay to Berthollet[30]. He just wishes to present the « general principles of the art », not the special technology of this chemical craft. Nevertheless, at the end of the article, Ure introduces the automatic dyeing steam bath used in Lancashire. It seems that Ure is inclined to include the art of dyeing, like the art of bookbinding, when the first steps towards mechanization have been made in these traditional arts.

From Ure's description of the operations and apparatus, the stocking frame, of the hosier[31], it is clear that hosiery is a craft operating with "more or less complex tools". According to Ure, "the frame is a machine, which requires considerable experience and care, both to work it to advantage, and also to keep it in good order".[32] It is precisely this regular attention which is required that puts hosiery into Christian's category of *métier*. But Ure would very much like to withdraw it from that category. It is here that his utopian view of the manufacturing mode of production can be seen at work. It would be a good thing to render the hosiery practice independent of the manual skills of the framework-knitter. To that end, hosiery should be mechanized. That was not the case in 1853, and that was a pity.

Hat Manufacture is another article[33] clearly showing Ure's utopian thinking. Like bookbinding, hat manufacture is a handicraft from beginning to end, and Ure knows it: "As the art of making common hats does not involve the description of any curious machinery, or any interesting process, we shall not enter into very minute details upon the subject".[34] But why would he include this craft in the first place? Because proposals to mechanize the trade met with unreasonable opposition:

> Their introduction is scarcely possible, on account of the perfectly organized combination which exists among journeymen hatters throughout the kingdom, by which the masters are held in a state of complete servitude, having no power to take a single apprentice into their works beyond the number specified by the *Union*, nor any sort of machine which is likely to supersede hand labour in any remarkable degree.[35]

By way of conclusion, it can be said that Ure includes the description of a few handicrafts or seeming handicrafts in three cases. Founding and weaving are two examples of a practice that, in 1795, still had the character of a craft but had subsequently been transformed into a manufacture. In the second case, the case of bookbinding and dyeing, a traditional craft had been invaded by a self-acting machine, and this should hopefully be regarded as the first stage of the complete absorption of this craft into the factory system. In the third case, the case of hosiery and hat manufacture, mechanization had not yet penetrated a traditional craft, not because of any intrinsic difficulties, but on account of successful opposition to penetration. In all cases, Ure's behaviour stems from his strong conviction that the artisan should be replaced by an automaton, and that in future the factory system would prevail over skilled labour: "It is, in fact, the constant aim and tendency of every improvement in machinery to supersede human labour altogether, or to diminish its cost, by substituting the industry of women and children for that of men; or that of ordinary labourers for trained artisans".[36]

Maybe the most telling example of Ure's selective policy is the exclusion of the machine itself. Of course, machines can be found on every page so to speak. Ure's *Dictionary* deals with industrial production in the mode of the manufacturer, after all. However, machines are presented as things employed. Their structure is described, accompanied by technical drawings. Their working is described. But there are no separate entries on machines, engines, steam engines, etc., describing how machines or engines are constructed. The reason for this is, I suspect, that machine construction is artisan's work.

One of the members of the London Corresponding Society (see fig. 2) was a machine-maker. (It was, in fact, Alexander Galloway). Originally, a machine-maker or "machinist" was an all-round artisan who combined

29 Andrew Ure., "Dyeing", *Dictionary of arts, manufactures, and mines, op. cit.*, n. 22, pp. 601-612.

30 Charles Dufay, "Observations physiques sur le meslange de quelques couleurs dans la teinture", *Mémoires de l'Académie des sciences*, année 1737, 1740, pp. 253-268 ; Claude-Louis & Amédée Berthollet, *Éléments de l'art de la teinture, avec une description du blanchîment par l'acide muriatique oxigéné,* Paris, Firmin Didot, 1804. This work had been translated into English by Ure in 1824.

31 Andrew Ure, "Hosiery", *Dictionary of arts, manufactures, and mines, op. cit.,* n. 22, pp. 1019-1025.

32 *Ibid*., p. 1024.

33 Andrew Ure, "Hat manufacture", *Dictionary of arts, manufactures, and mines, op. cit*., n. 22, pp. 993-1003.

34 *Ibid.,* p. 993.

35 *Ibid.,* p. 995.

36 A. Ure, *The philosophy of manufacture, op. cit*., n. 16, p. 23.

manual with intellectual skills : "The skills of the engineer were united in the 'machinist'– a versatile master of many trades, of considerable ingenuity and great mechanical knowledge who requires the talents and experience of the joiner, the brass and iron founder, the smith and the turner, in their most extended variety"[37]. By 1824, these different talents had become specialized skills, and in Alexander Galloway's "multidisciplinary" workshop, some 85 artisans were employed who represented several disciplines or sub-skills: cabinet-makers, joiners, millwrights, founders, smiths, filers, turners, etc. But this was still "old-fashioned" division of labour. During the 1840s, however, machine construction itself became mechanized, Hibbert & Platt employing around 2,000 men in their Oldham textile machinery works. Now, this development occasioned Ure to invite William Fairbairn to write an ode to the application of self-acting machines to the construction of machinery:

> It is nearly half a century since I first became acquainted with the engineering profession, and at that time the greater part of our mechanical operations were done by hand. On my first entrance into Manchester there were no self-acting tools. [… Now, …] the self-acting turning, planing, grooving, and slotting machines have afforded so much accuracy and facility for construction, as to enable the mechanical practitioner to turn, bore, and shape with a degree of certainty almost amounting to mathematical precision.[38]

Two conclusions

First, the *Dictionnaire technologique*, because of its completeness, presents a nice overview of the industrial arts as actually practised in the early nineteenth century. Ure's *Dictionary*, on the other hand, is highly selective, focuses on the manufacturing mode of production, and must also be considered a piece of propaganda for the factory system[39].

Second, during the first decades of the nineteenth century, a progressive narrowing of the meaning of the term Industry can be observed. Originally, "industry" included every activity between nature and consumption so to speak: agriculture, arts, crafts, trades, manufactures, transport, commerce. This inclusive meaning is effective in the make-up of the *Annales des arts et manufactures*, the *Annales de l'industrie*, and the *Dictionnaire technologique*, but also in Christian's and Ure's general technologies. Christian speaks of *industrie humaine* or *travail industriel*. Ure's general term is "operative industry". However, already in 1819, Christian introduces the concept of industrial labour *proprement dit*, which includes two modes of mechanical and chemical transformation but excludes agriculture and commerce. Twenty years later, Ure, haunted by his dream of automatons, further narrows the concept of industrial production properly so called, excluding not only agriculture and commerce but the mere handicrafts. In Ure's vocabulary, industry becomes practically synonymous with the factory system.

37 E. P. Thompson, *The making of the English working class, op. cit.*, n. 24, p. 271.

38 Andrew Ure, "Machines (self-acting)", *Dictionary of arts, manufactures, and mines, op. cit.*, n. 2, vol. 2, p. 86.

39 For the use made of Ure's works in French pleas for mechanization, see the paper contributed by François Jarrige, "Se prémunir contre les préjugés ouvriers. L'économie politique des machines entre l'Angleterre et la France (1800-1850)".